

Nanophotonics for optical big data storage: greener and faster

Min Gu

Laboratory for Artificial-Intelligence Nanophotonics,
School of Science, RMIT University, VIC 3001, Australia
email: min.gu@rmit.edu.au

Although big data centres that use electronic or magnetic recording media have emerged as a technology platform for storing a vast amount of data, this technology is not a sustainable solution for the digital future because a big data centre storing Petabyte data information needs huge space and consumes a vast amount of energy. However, 70%-90% of the generated data are cool data which do not need a frequent access and would not require energy for achieving. The optical data storage technology, though it has its distinguished feature of low energy consumption, has not been competitive due to the fundamental physical limit called Abbe's law discovered by a German physicist, Ernst Abbe, in 1873. Abbe's barrier means that the size of the information bits is approximately 300 nm, for example, in a blue-ray disk, resulting in the capacity cap of tens of Gigabytes for each disk. In this presentation, I will show how Abbe's limit can be broken in the recent development of optical beam nanolithography. Therefore, the information bit size can be remarkably reduced to 9 nm, which means that the capacity of an optical disk can be as high as Petabytes with a saving of energy by more than 1000 times as well as an ultralong lifetime up to 500 years. The Petabyte capacity optical storage technology will allow for the accelerating development of green optical data centres.

Biography



Professor Gu is Distinguished Professor and Associate Deputy Vice-Chancellor at RMIT University and was a Laureate Fellow of the Australian Research Council. He is an author of four standard reference books and has over 450 publications in nano/biophotonics. He is an elected Fellow of the Australian Academy of Science as well as the Australian Academy of Technological Sciences and Engineering. He is also an elected fellow of the AIP, the OSA, the SPIE, the InstP, and the IEEE. He was President of the International Society of Optics within Life Sciences, Vice President of the Board of the International Commission for Optics (ICO) (Chair of the ICO Prize Committee) and a Director of the Board of the Optical Society of America (Chair of the International Council). He was awarded the Einstein Professorship (Chinese Academy of Science, 2010), the W. H. (Beattie) Steel Medal of the Australian Optical Society (2011), the Ian Wark Medal and Lecture of the Australian Academy of Science (2014), the Boas Medal of the AIP (2015) and the Victoria Prize for Science and Innovation (2016). Professor Gu was elected as a Foreign Fellow of the Chinese Academy of Engineering in 2017.